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(54) A CONTROL SYSTEM CONTROLLING A DOOR, AND A
 DOOR HOLDER SUITABLE FOR USE IN SAID SYSTEM

(71) We, WILLIAM NEWMAN & SONS LIMITED, a British Company, of 268 Hospital Street, Birmingham B19 2YG, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a control system controlling a door and a door holder suitable for use in said system. The invention relates more particularly, but not exclusively, to control systems controlling, or holders for, doors (hereinafter referred to as "fire doors" and which may or may not be doors of fireproof construction) which are provided in buildings more specifically for the purpose of closing off from each other different parts of the building, for example for closing off passageways, such as corridors, from landings or stairwell areas, with a view to reducing fire risk.

According to one aspect of the present invention, a control system controlling a door comprises a door holder and a door closer device, said system including a stay arm which moves angularly when the door is being opened and closed, and said door holder comprising a support which carries both a slide and an electromagnet, an end of the stay arm being pivotally connected to said slide, and the electromagnet of the door holder normally remaining energised, whereby, when the door is in an open position, to act on the slide to hold open the door, through the stay arm, against the action of the door closer device, the current supply for said electromagnet being controlled by fire detection or alarm means whereby upon operation of, or a change in the condition of, said fire detection or alarm means in the event of fire, said current supply is cut off, or sufficiently reduced, to cause the electromagnet to become inoperative to allow the door then to be automatically closed by the action of the door closer device. The stay arm may be a stay arm of the door closer device. The door closer device may be attached to the

door and the door holder be attached to a door frame, with a stay arm of said door closer device pivotally and slidingly connected to the door frame through the door holder. The means for controlling the current supply to the electromagnet may, for example, be an automatic fire alarm, or an automatic sprinkler system, or a manual alarm system.

According to another aspect of the invention, there is provided in combination a door holder and a door closer device designed for attachment one to a door frame and the other to a door and suitable for use in a control system controlling a door as set forth in the last preceding paragraph, the door closer device having a stay arm which in use moves angularly when a door under the control of said device is being opened and closed, and the door holder comprising a support which carries both a slide and an electromagnet, an end of said stay arm being, or being capable of being, pivotally connected to said slide, and the arrangement being such that, in use, with the stay arm pivotally connected to the slide, the electromagnet, when it is energised and the door is in an open position, acts on the slide to hold open the door, through the stay arm, against the action of the door closer device.

According to a further aspect of the invention, there is provided a door holder suitable for use in a control system controlling a door as set forth in the penultimate preceding paragraph, said holder comprising a support which carries both an electromagnet and a slide, said slide being for pivotal connection to an end of an angularly-movable stay arm and having an armature for co-acting with said electromagnet, and said slide being slidable along said support from a position in which said armature is remote from said electromagnet to a position in which said armature is adjacent to said electromagnet, when, in use, a door under the control of the holder is moved to an open position, the electromagnet, when energised, holding by magnetic force the slide through said armature when the latter is in said adjacent

position whereby, in use, to hold open the door through the stay arm. The said support carrying the electromagnet and the slide may comprise an elongate casing which houses and guides the slide and houses the electromagnet and which is provided with a slot through which projects, or for receiving, a pivot, for pivotally connecting the slide to the stay arm. The said slotted casing may have at each end attachment brackets which can be rotated and secured to the casing in either of two positions mutually at right angles to each other to enable the casing, at will, to be secured, in each case with the slot therein directed downwards, either to a vertical side face, or a downwardly-presented horizontal face, of a top bar of a door frame.

An embodiment of the invention is illustrated, by way of example, in the accompanying drawings, in which:

Figure 1 shows a door holder in horizontal section, and applied to a vertical side face of a top bar of a door,

Figure 2 is a vertical section, on the line 11—11, Figure 1, of one end of said holder,

Figure 3 shows in elevation and end view a combined attachment bracket and terminal block housing of said holder,

Figure 4 is an end view of a casing of said holder,

Figure 5 is a fragmentary side view of said casing and shows attached to the casing the unit shown in Figure 3, and

Figure 6 is a diagrammatic view showing the said holder, the door, and a door-closing device.

Referring to the drawings, the door holder shown at H comprises an extruded-metal elongated casing 1 which is of square-sectioned exterior contour and of cylindrical form in interior contour, as shown in Figure 4, and which houses a slide 2 and a cylindrical electromagnet 3, the said electromagnet being provided, as shown, at one end of the casing and being a firm fit in the latter. The slide 2 comprises two parts, namely a cylindrical body part 4 conveniently made of a plastics material, for example that known as "Tufnol" ("Tufnol" is a registered Trade Mark) which is a sliding fit in the casing 1, and a cylindrical armature part 5 of magnetic material, said armature part 5 being disposed at that end of the slide which is nearest to the electromagnet 3 and being secured against the adjacent end face of the slide body part 4 by a screw 6, there being interposed a layer of foam rubber 7 between the said parts 4, 5 and a foam rubber liner 8 being placed in a hole 9, in the part 5, for the screw 6.

The casing 1 is provided at the bottom with a downwardly-presented slot 10 extending for almost the entire length of the holder, and projecting downwards through this slot 10 is a pivot 11 pivotally connecting the slide 2 to an end of a stay arm 12 of a spring door-closer

device S (Figure 6), attached to a hinged door D primarily intended as a fire door, said spring door-closer device S, being of any suitable construction whereby the arm 12 moves angularly in a horizontal plane as the door opens and closes. The pivot 11 is mounted in the slide body part 4 as shown and has thereon a nylon bush 13 slidably engageable with the slot 10.

The casing 1 is secured to a vertical side face 14 of a top bar of a frame for the door D by bracket arms 15 disposed one at each end of the casing, each bracket arm 15 forming part of a respective unit 16 constituting a combined attachment bracket and terminal block housing, and each said unit 16 having a cylindrical hollow boss 17 which fits into the respective end of the casing and is secured thereto by two screws 18 engaged with two of three holes 19 at 90° spacings provided in said respective unit 16. The arrangement is such that if it is desired to mortise the door holder in a horizontal bottom face of the top bar of the door frame, instead of securing the holder to a side face of said frame bar, the casing 1 can during installation be orientated, with the slot 10 still downwardly presented, so that the bracket arms 15 are at the bottom, in the position 15' indicated by broken lines in Figure 1, and the appropriate different selection made, as to which two of the three holes 19 in each unit 16 are to receive the screws 18.

Each hollow boss 17 is shaped and dimensioned to receive a terminal block 20 for connecting the ends 21 of a coil of the electromagnet 3 to external supply leads 22. Said terminal block 20 is housed in that boss 17 which is nearest to the electromagnet 3, and said boss 17 is secured to the latter by a screw 23, the other boss 17 being left unoccupied. A two-armed grommet 24 of synthetic plastics material is fitted into the outer end of each boss 17.

The current supply, through the leads 22, for the electromagnet 3 is controlled by fire detection or alarm means, shown diagrammatically at A in Figure 6, for example an automatic or manually-operated fire alarm, or an automatic sprinkler system. Conveniently the source of supply for the electromagnet is a 24-volt D.C. source.

In use, when the door is in a fully-closed position the slide 2 is in the position shown in Figure 1, that is at the end of the casing 1 which is remote from the electromagnet 3, but when the door is being opened the stay arm 12 moves angularly and causes the slide 2 to slide along the interior of the casing 1 towards the electromagnet 3, until when the door is in a fully-opened position the armature part 5 engages against the inner end face of the electromagnet 3. It is arranged that the said electromagnet 3 is normally kept continually in an operative energised condition whereby to act on the slide 2 to hold the door open

through the stay arm 12, against the action of the door closer, whenever the door is moved into an open position so that the armature part 5 engages the inner end face of the electromagnet as aforesaid. Thus, once fully opened, the door normally remains held, by the action of the electromagnet, in its open position, but the door can readily be closed again when desired by exerting thereon sufficient manual pushing or pulling force to separate the armature part 5 from the electromagnet. In the event, however, of operation, as a result of an outbreak of fire, of the fire detection or alarm means controlling the electromagnet 3 the current supply through the leads 22 to the electromagnet 3 is, as a consequence of this said operation, automatically cut off, or sufficiently reduced, to cause the said electromagnet 3 to become inoperative to allow the fire door then to be automatically closed into its protective position by the action of the spring door closer. The arrangement whereby the electromagnet becomes inoperative upon operation of the fire detection or alarm means constitutes a fail-safe arrangement, since the electromagnet will become inoperative, so as then to allow the door, if open, to close, upon failure of the electric supply for the electromagnet for any reason, for example as a result of burning-through of the leads 22.

The supply to the electromagnet could include one or more fusible links any of which, when overheated as a result of fire breaking out in its vicinity, fuses to cut off the current supply to the electromagnet.

If it is desired to convert the device shown to one of opposite hand, the two end units 16 can be removed, turned through 180°, and then replaced.

The invention is also applicable to doors other than doors specifically intended to serve as fire doors.

WHAT WE CLAIM IS:—

1. A control system controlling a door and comprising a door holder and a door closer device, said system including a stay arm which moves angularly when the door is being opened and closed, and said door holder comprising a support which carries both a slide and an electromagnet, an end of the stay arm being pivotally connected to said slide, and the electromagnet of the door holder normally remaining energised, whereby, when the door is in an open position, to act on the slide to hold open the door, through the stay arm, against the action of the door closer device, the current supply for said electromagnet being controlled by fire detection or alarm means whereby upon operation of, or a change in the condition of, said fire detection or alarm means in the event of fire, said current supply is cut off, or sufficiently reduced, to cause the electromagnet to become inoperative to allow the door then to be automatically closed by the action of the door closer device.

2. A control system controlling a door, as claimed in claim 1, wherein the stay arm is a stay arm of the door closer device.

3. A control system controlling a door, as claimed in claim 2, wherein the door closer device is attached to the door and the door holder is attached to a door frame, the stay arm of the door closer device being pivotally and slidably connected to the door frame through the door holder.

4. In combination, a door holder and a door closer device designed for attachment one to a door frame and the other to a door and suitable for use in a control system controlling a door as claimed in claim 2 or 3, the door closer device having a stay arm which in use moves angularly when a door under the control of said device in being opened and closed, and the door holder comprising a support which carries both a slide and an electromagnet, an end of said stay arm being, or being capable of being, pivotally connected to said slide, and the arrangement being such that, in use, with the stay arm pivotally connected to the slide, the electromagnet, when it is energised and the door is in an open position, acts on the slide to hold open the door, through the stay arm, against the action of the door closer device.

5. A door holder suitable for use in a control system controlling a door as claimed in claim 1 or 2, said door holder comprising a support which carries both an electromagnet and a slide, said slide being for pivotal connection to an end of an angularly-movable stay arm, and having an armature for co-acting with said electromagnet, and said slide being slidable along said support from a position in which said armature is remote from said electromagnet to a position in which said armature is adjacent to said electromagnet, when, in use, a door under the control of the holder is moved to an open position, the electromagnet, when energised, holding by magnetic force the slide through said armature when the latter is in said adjacent position whereby, in use, to hold open the door through the stay arm.

6. A door holder as claimed in claim 5, wherein the support carrying the electromagnet and the slide is an elongate casing which houses and guides the slide and houses the electromagnet, and which is provided with a slot through which projects, or for receiving, a pivot for pivotally connecting the slide to the stay arm.

7. A door holder as claimed in claim 6, wherein said slotted casing has at each end attachment brackets which can be rotated and secured to the casing in either of two positions mutually at right angles to each other to enable the casing, at will, to be secured, in each case with the slot therein directed downwards, either to a vertical side face, or a downwardly-presented horizontal face, of a top bar of a door frame.

8. A control system controlling a door, sub-

stantially as herein described with reference to Figures 1 to 6 of the accompanying drawings.

- 5 9. A door holder, substantially as herein described with reference to Figures 1 to 5 of the accompanying drawings.

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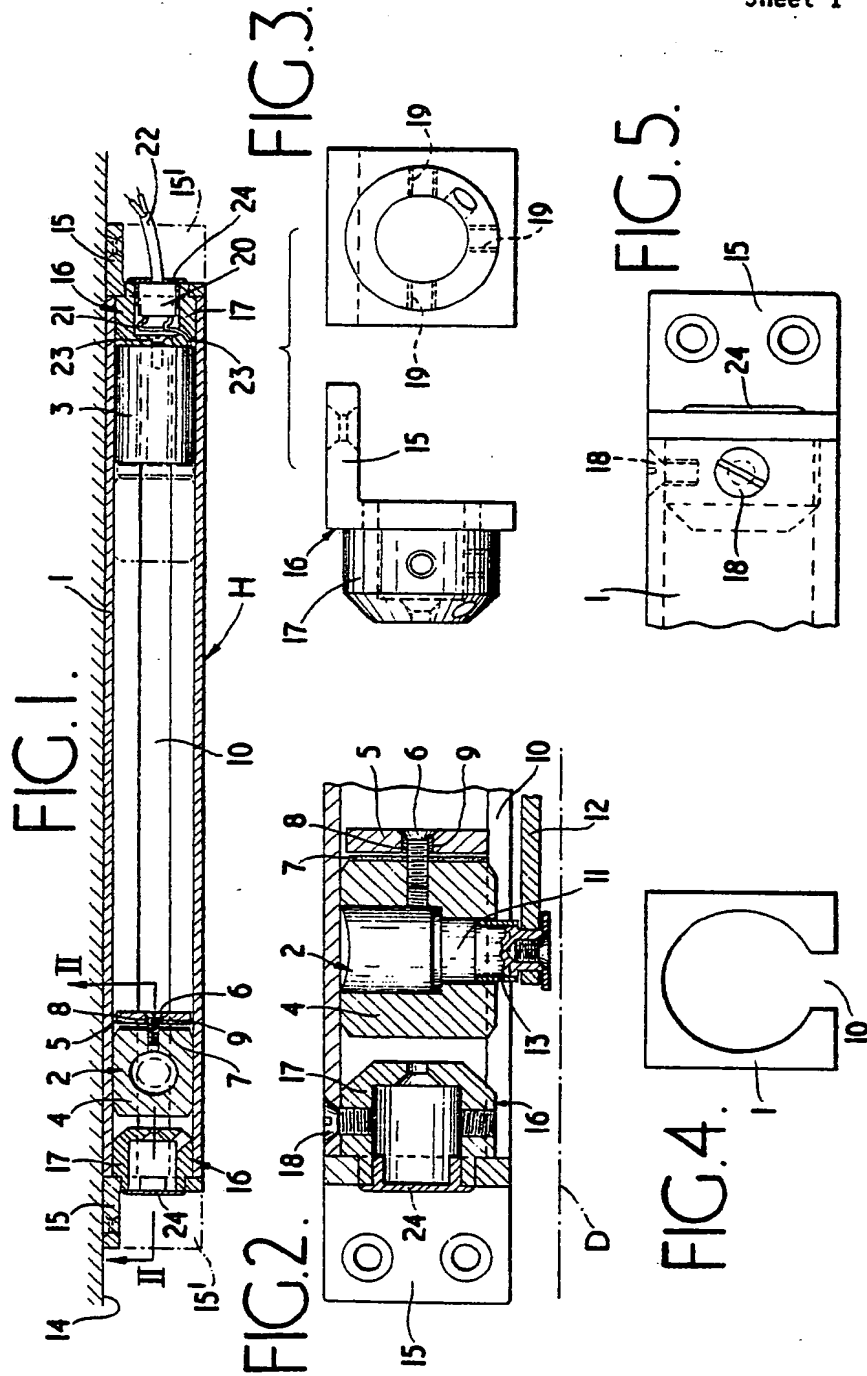


FIG. 6.

